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THESIS

THE VALUE OF CERTAIN TESTS OF SPEED, AGILITY, BALANCE, STRENGTH, AND MOTOR ABILITY IN PREDICTING PRACTICAL SUCCESS IN TERMS OF HONOR CREDITS IN A SCHOOL OF PHYSICAL EDUCATION.

SUBMITTED BY

ELIZABETH BRADBURY WELLMAN

B.S. IN ED. BOSTON UNIVERSITY 1928

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER IN EDUCATION. 1933

First Reader: Herbert Blair, Professor of Education.
Second Reader: Frederick Rand Rogers, Dean, Dept. of Health & Phys. Educ.

Boston University
School of Education
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INTRODUCTION

STATEMENT OF THE PROBLEM TREATED

A professional school of Physical Education receives each year a somewhat selected group of students. These students in the main choose a training school of this type because of aptitude or interest in Physical Education. However, each year it is apparent that these elements of personal choice are not always the best criteria of success in this field. As a result of such self-selection without adequate ground or experience for judgment, students are carried along who are, practically speaking, "dead wood" in school and profession. Many are retained through out the course because of intellectual capacity to do theoretical work. If they are graduated, disappointment follows. They cannot get positions because schools cannot recommend them highly enough in ability, or they do get jobs which they cannot hold because they are not truly fitted in motor understanding to teach motor activities. There is, therefore, a very definite need of some predictive measure of teacher success, a measure more objective than any at present in use.

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The problem has two sides: the non-physical side which includes such items as personality, intellect, and that intangible something which is perhaps best

described as understanding of other people, and the physical or motor capacity side. Neither one can be considered alone as indicative of success in teaching Physical Education; yet each, I believe, must be studied as an entity. I intend herein to present a small amount of data on the motor side, in an endeavor to make a start on the large problem of selecting or evolving a test which will adequately predict success on that side.

In considering teacher sucess on the motor side there are several factors involved:

1. Individual capacity for expert performance.
2. Capacity for motor analysis
3. Capacity for expression of such analyses in terms comprehensible to the average pupil.

The most measureable indication of all three, although one subject to the criticism of subjectiveness, is the students' records while in training school. Although grades are often too much influenced by instructors ' subjective judgment, there is no other measureable evidence of success to be had.

DESCRIPTION OF THE CRITERION AND THE TESTS USED

In this thesis grades shall be called by the term Honor Credits which will be taken to include only practice or motor subject grades. These grades have been awarded by three teachers teachers after at least one

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year's acquaintance with the student and her work. The factors involved in the grading have been the usual ones in professional schools: achievement tests, teaching ability, and theoretic understanding of the subject, resulting in a composite grade which is both subjective and objective in derivation. It should be mentioned, however, that two sets of grades were entirely objective. They were given by the writer in stunts and apparatus. The numbers of exercises successfully accomplished by each of the students were arranged in a frequency graph and the mean and standard deviation computed. Grades were then apportioned according to the location, or sigma index position, of each student on the baseline. This method of grading is purely objective, taking into consideration only the amount of work each student accomplishes in comparison with the rest of the group.

With Honor Credits as a criterion, then, this paper deals with an attempt to analyse various tests, some in common use today, to determine which if any may be used to predict student success and indirectly teacher success on the motor side, and the extent to which such predictions may be accepted as valuable.

The tests used, each of which will be described briefly, are as follows: the Brace Scale of Motor Ability Tests, the Rogers Physical Fitness Index, the Burpee Test,

and activity tests in speed, agility, and balance. Honor Credits are used as follows: A counted as 3 credits, B as 2, and C as 1 credit, the total being used for the whole year in all correlations. The possible total for any student amounts to 30 credits. Descriptions of tests follow:

THE BRACE SCALE OF MOTOR ABILITY TESTS

This scale consists of twenty tests which are of the stunt type. They call for coordinations of varying difficulty and represent, in their author's opinion, a variety of activities.[1] The author classifies the tests under the following headings: agility, balance, control, flexibility, agility and balance, strength, and strength and control.[2] Dr. Brace further defines control as being made up of balance and strength.[1] Therefore we may assume that the tests are primarily made of agility, balance, and strength since only two of twenty are classified as flexibility.[2] The tests, it is stated, are intended to test motor ability of a general sort and native rather than acquired.[3]

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The stunt-like nature is justified by the fact that tumbling and stunts received an average ranking of 2.5 from 74 judges who ranked ten motor activities, skill in which was to be taken as a criterion of general motor ability.[4] However, the tests have been criticised for the stunt character.[5] For a complete description of the scale see Brace, David K., the work cited.

A statistical analysis of this test into its component elements of balance, agility, and strength, using the balance and agility tests described later and the strength index from the Physical Fitness Index, yields the following interesting results: the scale correlates with balance .49, with agility .61, and with strength .57 . Partial correlation between the scale and balance with agility held constant is .40, between the scale and agility with balance constant is .54, between the scale and strength index with balance constant is .49, and between the scale and strength index with agility constant is .51 . The multiple correlation is .76 and the regression equation in deviation form reads:

Brace score = .37 balance + .23 agility + .004 strength

In the author's classification balance is involved in 11 tests, agility in 8, and strength in 7.[6]

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4. Brace, D.K. op. cit. p. 15
5. McCloy, C.H. Journal of Health and Phys. Ed Vol.III, No. 7
6. Brace, D.K. op. cit. p. 11

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6. Brace, D.K. op. cit. p. 11

In administering this test the students marked each other as suggested by the author.[7] The number of tests passed rather than the scale score has been used in this paper for all correlations, because of the uneven intervals of the transcribed score.[8]

THE ROGERS PHYSICAL FITNESS INDEX

This test is a modification of Dr. Dudley Allen Sargent's "Physical Test of a Man". It is primarily a strength test, involving the following battery of items: lung capacity, grip strength, arm strength in flexion and extension, leg strength in extension, and back strength. Arm strength is multiplied by $\frac{\text{wt.}}{10} + (\text{ht.} - .60)$ and added to the other factors to give the strength index which is divided by the normal strength index for that age and weight to give the Physical Fitness Index. Both the strength index undivided by the norm, and the computed P.F.I. will be used. For complete description of this test see Rogers, Frederick Rand Physical Capacity Tests , Barnes and Cp. 1930

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7. Brace, D.K. op. cit. p. 6
8. Ibid., p. 127

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8. Ibid., p. 127

THE BURPEE TEST

This is alittle known and little used test, sponsored by C. H. Mc Cloy in his writing and in his address at the convention of the American Physical Education Association in Philadelphia, April, 1932.[9] This test is given as follows (description from Mc Cloy, loc. cit.): upon command the pupil squats with knees deeply bent and places hands on the floor. He then extends the legs back to front rest or prone fall position, then returns to squat, and to stand. This action is repeated as many times as possible in ten seconds. The movements are counted in full numbers for completed action and in quarter counts for each additional position taken. That is, if the stopping signal comes as the pupil reaches the front rest position after the fifth complete action, her score will be five and one-half. The test is primarily one of agility and gig muscle coordination, according to Mc Cloy.[10]

BALANCE TEST

This test is composed of a battery of balance tests taken mainly from the Report of the Committee of the American Physical Education Association, November 1925.

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Two trials are allowed and the best one counted, all judgments being on the basis of success or failure. The sixteen tests used are as follows:

1. Stand with hands on hips, feet together and eyes open for ten seconds.
2. Stand as above but on one foot only (either foot), the other foot placed with sole against the inside of the opposite knee. Eyes open. Maintain this position for ten seconds without shifting feet or removing hands from hips.
3. As in 1. with eyes closed.
4. As in 2. with eyes closed.
5. Upon the signal, leap forward onto one foot, holding the other raised upward in back. Maintain the position for five seconds without shifting the supporting foot. Arms may be used to help hold the balance.
6. Stand with both feet together and keep them together throughout. Jump forward about twelve inches at the same time making a half turn in either direction. Hold the landing position without shifting the feet. Failure if turn is more or less than half.
7. Leap forward with the leg extended in back

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7. Leap forward with the leg extended in back as in

as in 5. and hold for five seconds, then leap forward again onto the other foot with free foot raised forward and hold for ten seconds. Failure if directions are not folloed correctly, or if feet are moved other than the two leaps.

8. Leap to either side onto one foot with the free foot raised sideward, hold the position for five seconds, then on the same foot hop sideward toward the raised foot and hold the landing position ten seconds.
9. Stand with feet together. Step forward onto one foot, then leap forward onto the other foot making a half turn toward the stepping foot and landing with the free foot raised backward. Maintain final position ten seconds.
10. Leap forward onto one foot with the other raised forward. Move the free leg slowly backward and hold ten seconds.
11. Prone fall position: upon the signal raise one hand and the opposite foot from the floor and hold position for five seconds.
12. Hop forward onto one foot, catching the toe of the opposite foot with one hand behind

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the back. Hold for ten seconds.

13. Hop sideward onto one foot and hold the position for five seconds, then jump into the air clicking heels together once, landing on same foot as before, and hold ten seconds.

14. Stand on one foot with arms free for balance. Rise on the toe and bend and extend the knee as deeply as possible five times, without touching the free foot to the floor, without lowering the heel, and without shifting the toe about on the floor.

15. With feet slightly apart, bend knees deeply. Place the hands on the floor between the knees and with elbows pressed against the legs. On the signal, lean forward until the weight is removed from the feet and placed entirely on the arms with the feet off the floor. Hold this balance position for five seconds.

16. Stand on one foot with the other foot extended forward. Upon the signal, rise on the toe and hold for five seconds without lowering the heel, touching the free foot to the floor, or shifting the supporting foot.

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AGILITY TEST

This test measures the pupils' ability to lift thebody mainly by the leg muscles upward and forward. It consists of two tests, a standing high jump and a standing broad jump.

High Jump: The pupil stands facing a wall upon which has been attached a blackboard at least three feet in height and placed with its lower edge at a measured distance from the floor (the distance may well be five feet as long as all those to be tested are not shorter than four feet in height). The pupil chalks the fingers of her right hand hand with magnesium or some other easily applied and non-injurious substance. Then, toeing the wall, she reaches as high as possible without removing the heels from the floor and presses her fingers against the blackboard. The pupil then stands with her right side toward the wall but far enough away to allow her to swing her arms. Making full use of the arm drive, she springs upward to touch the board at the greatest height she can reach. The distance between the standing touch and the jumping touch are measured using in each case the topmost smear of the chalk on the board. The result is, in inches, the actual height which she lifted her body from the floor. It is important that the pupils be thoroughly familiar with the jump and

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pupils be thoroughly familiar with the jump and

practice it to attain the greatest possible height so that the test may be reliable.

Broad Jump: The student stands upon a mat or upon the floor toeing a narrow starting line. (It is important that either floor or mat be used throughout, and not interchangeably. If a mat is used, it must be held stationary to avoid its slipping with the momentum of the jump.) Using the arm drive, the pupil jumps forward as far as possible. The distance is measured from the back of the heel where it strikes the floor to the nearest edge of the starting line, the tape running at right angles to the line, giving in inches the distance the body has been carried forward.

In the high jump the factor of height has been eliminated by the reach height taken as the limitation of the measurement. The correlation between height of jump and body weight is -.15, showing that weight has practically no effect upon the height of the jump. The correlation between broad jump and height was equally negligent, being .09 . The two jumps correlated .53 . The high jump correlated with the Brace test .51, and broad jump with Brace .61, while the sum of the two, which has been here used as the agility factor, correlated with Brace .60, which would seem to indicate that the broad jump alone would have been as good an index of

motor ability (as measured by the Brace test) as the two taken together.

SPEED TEST

This test is a run of two laps on an oval indoor track with an inside measurement of 157 feet or just over 50 yards, making a total run of a little over 100 yards. All timing was done by one person and the runners were clocked from the starting signal until any part of the runner had crossed the finish line. Times were read to the nearest tenth of a second.

TEACHER RANKING

At the end of the year three teachers ranked the pupils in general motor ability using the Man-to-Man type of scale.[11] The ranking teachers were those who had had the most opportunity to be well acquainted with the pupils. Each teacher was given a roll sheet with the following instructions:

> "Please rank these pupils in MOTOR ABILITY, i.e. capacity for motor accomplishment. Do not include in your consideration such items as effort, interest, laziness, etc. Make out the ranking scale below and use it as a basis for your judgments. Fill in the numbers in the following order: 1, 5, 3, 2, 4 with the name of a girl whom you believe fits the qualifications desired :

11. Symonds, P.M. Measurement in Secondary Education p. 341

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1. Symonds, P.M. Measurement in Secondary Education p. 341

1. A girl outstanding in motor ability, excellent.

5. A girl outstandingly lacking in motor ability.

3. A girl of average ability.

2,4. Girls between the average and the nearer end of the scale."

RANKING SCALE

1.

2.

3.

4.

5.

Ranking by (teacher's signature)_____

Date_____

How many years have you taught these girls?_____

How many semesters each year ?_____

How many hours per week ?_____

- - - - - - - - - - - - - - - - -

It is interesting to note that without reference to each other the ranking in over 50 % of the cases was perfect, with three teachers ranking 169 cases. (See Complete Score Table, columns 10 and 11)

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RELIABILITY OF THE TESTS

The Physical Fitness Index and the strength index are known to be highly reliable, having reliability coefficients above .94.[14] Mc Cloy has found a reliability of .669 for the standing broad jump, and .737 for the running high jump.[15] (It is not unreasonable to expect that the standing high jump would yield a coefficient of about the same height.) Dr. Brace claims a reliability of .90 for his scale, but the method by which this coefficient was established is so unusual as to make one doubt its accuracy.[16] Bovard and Cozens have found the reliability of the 100 yard dash to be .97.[17] No figures have been offered for the Burpee Test. Reliability is unknown and probably low for balance, honor credits, and teacher ranking. Bovard and Cozens say that tho the reliability of marks is low, school marks are one of the most important predictions of future school success.[18] Symonds, in speaking of ranking says that ratings by several persons well acquainted with the subject may give a reliable estimate.[19]

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14. Rogers, ~~E~~.R. Fundamental Administrative Measures in Physical Education p.147,148
15. Mc Cloy, C.H. Measurement of Athletic Power p.57
16. Brace, D.K. op. cit. p. 96
17. Bovard and Cozens Tests and Measurements in Physical Education p. 234
18. Bovard and Cozens op. cit. p.500
19. Symonds, P.M. Measurement in Secondary Education p. 350,353

RELIABILITY OF THE TESTS

The Physical Fitness Index and the strength Index are known to be highly reliable, having reliability coefficients above .90.[14] Mc Cloy has found a reliability of .669 for the standing broad jump, and .737 for the running high jump.[15] (It is not unreasonable to expect that the standing high jump would yield a coefficient of about the same height.) Dr. Brace claims a reliability of .90 for his scale, but the method by which this coefficient was established is so unusual as to make one doubt its accuracy.[16] Boyard and Cozens have found the reliability of the 100 yard dash to be .97.[17] No figures have been offered for the Burpee Test. Reliability is unknown and probably low for balance, honor credits, and teacher ranking. Boyard and Cozens say that the reliability of marks is low, school marks are one of the most important predictions of future school success.[18] Symonds, in speaking of ranking says that ratings by several persons well acquainted with the subject may give a reliable estimate.[19]

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14. Rogers, F.R. Fundamental Administrative Measures in Physical Education p. 147, 148
15. Mc Cloy, C.H. Measurement of Athletic Power p.57
16. Brace, D.K. op. cit. p. 96
17. Boyard and Cozens Tests and Measurements in Physical Education p. 274
18. Boyard and Cozens op. cit. p.503
19. Symonds, P.M. Measurement in Secondary Education p. 350, 353

The data obtained were handled statistically, using the Pearson Product Moment method of correlation and the Yule method of Partial and Multiple Correlation.[13]

Honor credits correlated highest with the Physical Fitness Index, the correlation coefficient being .53 and the predictive index 15 %. The correlations with the other tests were as follows:

Test	Correlation	Predictive index
Brace	.35	6 %
Speed	.39	8 %
Agility	.38	7.5 %
Burpee	.37	7.1 %
Balance	.23	3 %

It is interesting to note that while P.F.I. correlates slightly less than twenty points higher than Brace with the criterion, the predictive index for the P.F.I. correlation is more than double that for Brace. Also, ~~1/2~~ the partial correlation between Honor credits and Brace with P.F.I. held constant is -.037, showing practically no relationship beyond the strength factor.

Honor credits correlated with teacher ranking only .72. The figue would probably have been greater had rankings been made by all the teachers.

The highest correlations obtained between any two tests were speed and agility .73 and Brace and P.F.I. .72.

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13. Garrett, H.E. Statistics in Psychology and Education

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Test	Correlation	Predictive Index
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Agility	.38	7.5 %
Burpee	.37	7.1 %
Balance	.25	3 %

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15. Garrett, H.E. Statistics in Psychology and Education.

The correlation between speed and the Burpee test is surprisingly low, being only .31. Teacher ranking gave its highest correlation with Honor credits as would be expected, the next highest with speed .59, with P.F.I. .53, and with agility .52 .

Using a battery composed of speed, agility, and Burpee produces the prediction formula for honor credits as follows:

Honor Credits = .61 speed + .09 agility + 1.7 Burpee - 11

with a Probable Error of Estimate of 2.54. The multiple correlation of this battery with Honor Credits, however, is only .50, indicating that Honor Credits predicted from this battery will correlate with actual Honor Credits received .50, or in terms of the prediction index, the predicted number of honor credits will be correct in 13 % of the cases. Although these figures are too low to warrant use, nevertheless the equation gives us some idea of what to expect from the student. (See Table VIII, column I for application of the equation to a random selection of cases.)

Using the two better known tests as a battery, i.e. Brace and P.F.I., gives a resulting formula for prediction of honor credits as follows:

Honor Credits = .10 P.F.I. - .077 Brace + 10.44

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Using the two better known tests as a battery, i.e. Burpee and P.F.I., gives a resulting formula for prediction of honor credits as follows:

Honor Credits = .19 P.F.I. - .077 Burpee + 10.44

with a Probable Error of 2.51 . The coefficient of multiple correlation with this battery os also .50, indicating as did the other battery that 13 % of the predictions made from this formula will be accurate.(For application to a random sampling of the cases, see Table VIII.)

The three tests showing the highest correlations with honor credits are as follows:

P.F.I.	.53
Speed	.39
Agility	.38

Using these tests as a battery results in the formula

Honor Credits = .08 P.F.I. - .16 speed + .07 agility + 9.35

with a Probable Error of 2.43 and a multiple correlation of .56 .

The increase of the coefficient of multiple correlation in this battery gives an increase of the predictive index from 13 % to 17 % which is a worthwhile gain.* To be useable, however, the correlation should be as near .90 as possible.

It is evident from the figures presented herein that, from the standpoint of prediction of practical success

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* Predictive Indices taken from the formula
P.I. = $1 - \sqrt{1 - r^2}$

with a Probable Error of 2.51 . The coefficient of multiple correlation with this battery as also .50, indicating as did the other battery that 15 % of the predictions made from this formula will be accurate.(For application to a random sampling of the cases, see Table VIII.)

The three tests showing the highest correlations with honor credits are as follows:

P.F.I.	.53
Spread	.39
Agility	.38

Using these tests as a battery results in the formula

Honor Credits = .08 P.F.I. - .16 spead - .07 agility + 9.35

with a Probable Error of 2.43 and a multiple correlation of .56 .

The increase of the coefficient of multiple correlation in this battery gives an increase of the predictive index from 15 % to 17 % which is a worthwhile gain.* To be useful, however, the correlation should be as near .90 as possible.

It is evident from the figures presented herein that, from the standpoint of prediction of practical success

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in terms of honor credits in this school for teachers of Physical Education, of the tests considered the combination of Physical Fitness Index, speed, and agility gives the highest prediction index and is therefore the most useful. The multiple correlation of this battery with the criterion being, however, only .56 leaves much to be desired. P.F.I. alone correlates with honor credits .53 which is higher than either of the other batteries and only .03 lower than the best battery. In which case, it seems that the result is not worth the added labor of giving and computing scores from the battery, since the P.F.I. alone will give results very nearly as accurate.

It must be understood that the work herein set forth is only a small beginning on the task of making a prediction test for success in the teaching field of Physical Education. As previously stated, this paper deals only with the teacher's own success in motor activities, which is an integral part of teacher qualification. The work must be carried much further into the field of actual follow up work of these students after graduation and into their teaching careers, as well as into the more abstract and less measureable but perhaps more important qualifications of the successful teacher.

It is interesting to note that the single element

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It is interesting to note that the single element

with the highest correlation to success as here measured is strength, and that the nearest three are strength, speed, and agility. This seems to indicate that a test of "motor ability" or "motor capacity" might be a more truly representative picture if it were confined to familiar activities of everyday life, in which the chances are much greater of obtaining a measure of the individual's natural development and ability than in stnuts or coordinations, so many of which are unfamiliar to the average person.

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COMPLETE SCORE TABLE I

1	2	3	4	5	6	7	8	9	10 a	10 b	10 c	11
1	11		69.00	1425	94		5.5	17	5		3	
2	11	10	72.25	1549	106	22.7	5.5	13	5		4	
3	15	13	91.00	1580	140	20.2	6.5	23	3		3	*
4	10	13	82.50	1573	111	19.8	5.5	19	4		3	
5	10	12	70.75			21.2	5.5		4		4	*
6	10	12	76.75			21.2	5.0	18	4		4	*
7			81.00			19.9	6.5	23	3		2	
8	7	7		1147	77	24.0	6.0	15	4		4	*
9			82.75	1346	100	20.7	6.0	14	4		4	*
10			57.00	1025	77		5.5	10	5		5	*
11							5.5	15	4		4	*
12						20.7		9	5		5	*
13			85.5	1649	119	21.0	6.0	22	3		3	*
14	7		72.75	1190	66	23.4	5.0	10	4		3	
15			103.00				5.5	19	2		4	
16	11	14	74.00	1241	77	22.4	5.0	13	4		4	*
17	12	15	77.75	1424	113	20.9	6.0	25	2		2	*
18	12	14	83.00			20.2	5.5	19	3		4	
19	9	11	62.50			23.5	4.5	16	4		4	*
20	11	12	81.50	1384	112	21.0	6.0	18	4		4	*
21	11	13	70.50			20.6	6.5	21	3		4	
22	9	10	76.25			23.4	5.0		5		5	*
23	11	14	94.50	1394	92	19.8	4.5	18	3		3	*
24	10	13	69.75	1169	100	20.8	5.5	19	3		4	
25	11	11	78.50	1268	116	20.6		14	4		5	
26						21.7		16	3		5	
27	14	13	85.75	1494	108	21.2	5.5		3		3	*
28	8		73.00					11	4		5	
29			70.50	1222	82			14	5		2	
30			84.50	1639	104	18.7		16	3		3	*
31	13	14	81.00			19.8	6.5		2		4	
32	11	11	80.00	1491	114	19.7	5.5	23	3		2	
33	11		78.00			21.2		9	5		5	*
34	9		79.00	1313	96	20.4	5.0	20	3		3	*
35	14	15	85.50			19.5	6.0	16	2		3	
36	11			1484	133	19.4		18	3		4	
37	13	14	82.50	1490	114	21.0	6.5	15	3		3	*
38	11		77.50	1471	118	19.8		14	4		5	
39	9	11	73.25	1228	138	20.2	6.0	26	3		2	
40	9	9	75.00	1474	113	21.0	6.0	19	4		4	*
41	17	16	86.25			19.7	6.0		3		2	
42	10	11	73.25			21.3	6.0	23	4		3	
43	9	10	72.50	1384	107	22.4	6.0	18	4		3	
44	8	11	73.00	1340	88	22.4	6.0	20	5		5	*
45	11	16	84.25			19.0		27	1		1	*
46	11		79.25	1807	115	20.0	6.0	20	3		3	*
47	11	15	77.00	1544	105	20.6	6.0	20	2		2	*
48	9		70.25	1287	75	21.0	6.0	19	4		3	

Column number headings:

1 Case number
2 Brace score
3 Balance score
4 Agility score
5 Strength index
6 P.F.I.
7 Speed score
8 Burpee score
9 Honor credits
10 Judges' rankings
11 Ranking agreement

Complete Score Table continued

49	11	15	80.50	1777	123	21.2	6.0	21	3	3	*
50	12	15	74.00	1482	101	20.4	5.0	16	3	3	*
51			81.50	1734	150	20.0		22	3	3	*
52	11	16	81.25	1922	104	19.2	6.5	25	2	2	*
53	13	12	83.25	1686	122	20.0	6.0	21	3	3	*
54	13	15	80.25	1324	99	20.6	6.5	24	3	2	
55			77.75	1534	88	20.2	5.5	20	3	3	*
56	14	16	86.25	1482	130	20.0	6.0	26	2	2	*
57			83.50			21.2		19	3	4	
58	16	15	81.00	1292	151	19.4	6.0	26	2	1	
59	15	14	82.75	1522	98	20.0	6.0	25	1	1	*
60				1596	84		5.0	18	3	3	*
61	18	16	96.00	2160	148	18.6	9.5	28	1	1	*
62	15	13	88.00	1951	164	18.7	6.5	20	2	2	*
63	17	15	89.00			19.8		28	1	1	*
64	14	15	86.00	2112	150	19.6	6.0	23	1	3	*
65	10	13	79.75	1786	129	20.0	5.5	25	3	2	
66	17	15	93.25	1803	169	19.6	5.5	28	2	2	*
67	16	14	88.75	2093	183	18.7	6.0	22	3	3	*
68	16	15	90.50	2023	151	18.7	6.5	20	3	3	*
69	14	16	81.50			21.2	6.0	26	3	4	*
70	10	13	71.25	1231	70	22.4	6.0	18	4	3	
71	16	15	83.50	1797	125	20.4	6.5	19	3	3	*
72	11	12	74.00	1755	101	21.4	6.0	19	3	4	
73	11	15	83.75	1856	108	20.0	5.5	22	2	2	*
74	15	15	85.50	1746	126	20.1	5.5	20	2	3	
75	8	14	69.00			21.6	6.0	21	3	2	
76	12	13	85.75	1347	118	19.2	6.0	25	2	3	
77						19.3	6.5	21	3	2	
78	13	15	88.75			20.4	6.5	21	3	2	
79	11		79.50	1729	140	20.2	6.0	26	2	2	*
80	8		74.75	1246	116	20.8	6.5	22	3	2	
81	18	14	93.25	2491	161	19.2		24	1	2	
82			87.00	1590	123	19.5		20	4	5	
83			81.00	1493	126			20	3	3	*
84	10		84.00			21.4			5	5	*
85	10		65.50			22.0			4	4	*
86	14	13	83.50	1493	124	20.4	5.5	30	1	1	*
87	8	12	79.00	1420	95	22.5	6.5	23	3	3	*
88	20	16	97.25	1854	162	18.7		24	1	2	
89	9		79.25	1442	89	21.6	7.0	21	4	2	
90	14	15	76.00	1356	106	20.3	6.5	20	3	3	*
91	7		76.00	1274	92	20.3	5.0	19	2	4	
92	13	12	92.00			19.6		10	3	5	
93	10	16	94.00	1175	107	19.2	6.5	20	2	3	
94	11	13	101.0	1783	116	19.8	6.5	19	3	5	
95	9		72.75			22.3	5.0	19	4	4	*
96	10	14	81.50			20.7	6.5	21	2	1	
97	7	15	76.25	1166	81	22.3	6.5	17	4	3	

Complete Score Table continued

98	14	12	76.50	1298	105	21.6	6.0	21	3	3	*
99	15	16	91.25	1534	93	20.5	5.5	13	3	3	*
100	15	13	73.00	1410	103	22.7	7.0	23	3	4	
101	9	16	74.00	1406	97	21.2	6.5	24	3	3	*
102	7	11	65.00	1194	59	22.5	6.0	17	4	4	*
103	11		91.25	1858	90	20.2	6.0	16	4	4	*
104	11	13	76.00	1799	116	21.4	6.0	24	3	3	*
105	10	12	78.25	1425	108	20.7	7.0	21	3	2	
106	8	12	85.75	1572	106	19.3	6.5	20	2	3	
107	9	11	83.25			19.5	5.5	24	2	2	*
108	7	13	85.75	1723	123	20.9	6.0	23	3	3	*
109		14	68.75	1246	102	22.5		13	4	5	
110	12	15	76.75	1504	100	21.8		23	4	3	
111			82.75			21.0	6.0	13	3	4	
112	9					21.8	6.0		4	4	*
113	10	13	69.00			21.4	5.5	20	4	3	
114	14	15	96.75			19.1		20	1	1	*
115	9	11	61.50	1270	90	24.0		20	3	3	*
116	12	14	86.25	1817	136	19.8	6.5	20	2	2	*
117	12	12	86.00	1640	126	20.2	6.5	26	2	3	
118			91.75	1372	113	19.7	6.5	21	3	3	*
119	10	13	78.50	1538	109	21.2	6.0	23	3	3	*
120	10	14	80.00	1085	87	19.4	6.0	19	3	3	*
121	11	13	87.00	1199	110	21.0	6.5	23	2	2	*
122	10	14	89.50	1356	115	21.5	6.0	23	2	2	*
123	9	12	71.00	1016	82	22.0	6.5	16	5	3	
124	11	16	88.50	1395	129	20.2	7.5	23	3	3	*
125	7	14	65.00			21.6	7.0	17	5	2	
126	6	12		1185	95	19.1	6.5	20	2	2	*
127	12	13	95.00	1382	109	20.8	7.5	21	2	2	*
128	10	16	75.50	1268	82	21.5	6.0	21	3	3	*
129	9	12	66.50	1185	96	22.0			3	3	*
130	7	9	75.50	1051	58	22.8	4.5	13	5	4	
131	13	10	80.5.	1458	124	20.8	5.5	24	3	2	
132	12	16	75.00			22.6		11	4	5	
133	8	13	63.00	910	70	21.4	5.5	14	3	4	
134	13	13	77.75	1656	100	21.0		21	2	4	
135	13	14	101.50	1447	119	21.1	5.5	23	2	2	*
136	8	11	59.25			22.5	6.0	17	4	3	
137	10	11	94.00	1736	111	19.0	5.5	21	3	3	*
138	8	14	76.00	1100	89	22.0	5.5	17	3	5	
139	10	14	76.50	1170	77	22.2	5.5	19	4	3	
140	5	8	81.50	1178	79	21.9	5.0	20	4	2	
141	8	15	67.25			23.8	5.0	20	2	2	*
142	8	12	69.75	1237	60	23.5	5.5	20	4	3	
143	8			1611	100	21.8		19	4	3	
144	8	12	82.00	1251	86	21.6	6.0	14	4	3	
145	12	14	79.50	1672	115	21.3	6.0	24	3	2	
146	9	11	86.75	1278	106	21.4	5.0	21	3	3	*

Complete Score Table continued

147	14	14	85.00	1379	110	20.2	5.0	17	3	3	*
148	7			1483	87		4.0	14	4	5	
149	9			1460	107			11	1	3	
150	8	11	68.25	1396	99	22.6	5.5	23	3	3	*
151	12	14	78.75	1372	132	20.2		23	1	3	
152	10	10	75.75	1191	91	20.6	5.5	17	4	4	*
153	7	15	77.00	1498	88	21.7	6.0	23	3	3	*
154	3	14	60.50	1229	71	23.2	4.0	13	5	4	
155	8	10	60.50	1456	107	21.2	5.5	19	3	3	*
156	10	14	84.50	1649	105	19.6	6.0	20	3	3	*
157	10	14	62.50	945	60	24.2	6.0	14	5	4	
158	13	14	93.50	1670	106	21.0	5.5	14	2	5	
159	8		80.50			20.2		20	3	3	*
160	13	12	84.50	1324	95	20.2	6.0	26	3	3	*
161	10	15	66.75			23.3	6.0	14	4	5	
162	12	13	76.75	1495	132	21.2	6.0	24	3	2	
163	11			1573	126	19.8	6.0	21	2	4	
164	7	10	63.50	1126	57	24.4	5.5	13	5	5	*
165	11	16	83.25	1796	125	19.9	5.5	20	2	3	
166	10	12	87.00	1628	93	20.5	5.5	19	3	3	*
167	7		70.00	1318	68	22.5	6.0	17	4	3	
168	11	10	84.50	1408	88	21.4	5.0	16	4	4	*
169	9	13	81.75			20.9	5.5	24	3	3	*
170	10	14	73.50	1227	79	22.4		13	4	3	

TABLE II

TEST SCORE MEANS AND STANDARD DEVIATIONS

TEST	MEAN	STANDARD DEVIATION
P.F.I.	107.01	24.6
Burpee	6.35	.665
Brace	10.78	2.85
Speed	21.515	1.31
Agility	83.05	9.0
Balance	13.27	1.8
Honor Credits	20.28	4.3
Ranking	6.43	1.7

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TEST SCORE MEANS AND STANDARD DEVIATIONS

TEST	MEAN	STANDARD DEVIATION
P.P.I.	107.01	24.6
Burpee	6.35	.665
Brace	10.78	2.85
Speed	21.515	1.31
Agility	83.05	9.0
Balance	13.27	1.8
Honor Credits	20.28	4.3
Ranking	6.43	1.7

TABLE III

ZERO ORDER CORRELATIONS AND PREDICTIVE INDICES

A. HONOR CREDITS

TEST	CORRELATION	PREDICTIVE INDEX
Ranking	.72	31 %
P.F.I.	.53	15 %
Speed	.39	8 %
Agility	.38	7.5 %
Burpee	.37	7.1 %
Brace	.35	6 %
Balance	.23	3 %

B. BRACE TEST

P.F.I.	.72	31 %
Strength	.61	21 %
Broad jump	.61	21 %
Agility	.60	20 %
Speed	.59	19 %
High jump	.51	14 %
Balance	.49	13 %
Honor credits	.35	6 %

C. RANKING

Honor credits	.72	31 %
P.F.I.	.60	20 %
Speed	.59	19 %
Agility	.52	15 %
Brace	.45	11 %
Balance	.41	9 %
Burpee	.32	5.3 %

D. BALANCE

Brace	.49	13 %
Ranking	.41	9 %
Speed	.40	8 %
Strength	.34	6 %
Agility	.32	5.3 %
Honor credits	.23	3 %
High jump	.21	2 %

TABLE III

ZERO ORDER CORRELATIONS AND PREDICTIVE INDICES

A. HONOR CREDITS

TEST	CORRELATION	PREDICTIVE INDEX
Ranking	.72	31
P.P.I.	.53	15
Speed	.39	5
Agility	.38	7.5
Burpee	.37	7.1
Brace	.35	3
Balance	.25	3

B. BRACE TEST

P.P.I.	.72	31
Strength	.61	21
Broad Jump	.61	21
Agility	.60	20
Speed	.59	19
High Jump	.51	14
Balance	.49	13
Honor credits	.35	6

C. RANKING

Honor credits	.72	31
P.P.I.	.60	20
Speed	.59	19
Agility	.59	19
Brace	.45	9
Balance	.41	9
Burpee	.32	5.3

D. BALANCE

Brace	.49	15
Ranking	.41	9
Speed	.40	9
Strength	.34	6
Agility	.32	5.3
Honor credits	.29	5
High Jump	.27	5

E. SPEED

Agility	.73	32 %
P.F.I.	.68	27 %
Ranking	.59	19 %
Brace	.59	19 %
High jump	.45	11 %
Balance	.40	8 %
Honor credits	.39	8 %
Burpee	.31	5 %

F AGILITY

Speed	.73	32 %
Brace	.60	20 %
P.F.I.	.54	16 %
Ranking	.52	15 %
Honor credits	.38	7.5 %
Balance	.32	5.3 %
Strength	.31#	5 %
Burpee	.26	4.5 %

G. BROAD AND HIGH JUMPS

Broad w. high jump	.53	15 %
Broad w. height	.09	.41 %
High w. weight	-.15	-1.2 %

Some of these low correlations would undoubtedly be considerably raised if they were computed by the Eta method for non-linear relationship. For example, the correlation between agility and strength index by the Product Moment method is .31, by the Eta method .60 , showing a raise of 29 points. In the case of P.F.I. and Brace, however, where the relationship is more nearly linear, the Eta method raises the correlation from .72 only to .745 .

E. SPEED

Agility	.73	32 %
F.F.I.	.68	27 %
Ranking	.59	19 %
Brace	.59	19 %
High Jump	.45	11 %
Balance	.40	8 %
Honor credits	.39	8 %
Burpee	.31	5 %

F AGILITY

Speed	.73	32 %
Brace	.60	20 %
F.F.I.	.54	16 %
Ranking	.52	15 %
Honor credits	.38	7.5 %
Balance	.32	5.3 %
Strength	.31	5 %
Burpee	.26	4.5 %

G. BROAD AND HIGH JUMPS

Broad w. high jump	.53	15 %
Broad w. height	.09	.41 %
High w. weight	-.15	-1.2 %

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* Some of these low correlations would undoubtedly be considerably raised if they were computed by the Eta method for non-linear relationship. For example, the correlation between agility and strength index by the Product Moment method is .31, by the Eta method .60 , showing a rise of 29 points. In the case of F.F.I. and Brace, however, where the relationship is more nearly linear, the Eta method raises the correlation from .72 only to .745 .

TABLE IV

FIRST ORDER CORRELATIONS

Honor Credits and Brace with P.F.I. constant		-.037
Honor Credits and P.F.I. with Brace	"	.42
Honor Credits and P.F.I. with speed	"	.39
Honor Credits and speed with agility	"	.05
Honor Credits and Burpee with speed	"	.248
Honor Credits and agility with speed	"	.16
Honor Credits and agility with P.F.I.	"	.13
Honor Credits and Burpee with agility	"	.304
P.F.I. and Brace with Honor Credits	"	.67
P.F.I. and Agility with speed	"	.09
Brace and balance with agility	"	.40
Brace and strength index with agility	"	.56
Brace and agility with balance	"	.54
Brace and strength index with balance	"	.54
Balance and strength index with agility	"	.27
Agility and strength index with balance	"	.25
Agility and speed with P.F.I.	"	.59
Agility and Burpee with speed	"	.05
Speed and Burpee with agility	"	.284

TABLE IV

FIRST ORDER CORRELATIONS

Honor Credits and Brace with P.P.I. constant	"	-.037
Honor Credits and P.P.I. with Brace	"	.42
Honor Credits and P.P.I. with speed	"	.39
Honor Credits and speed with agility	"	.05
Honor Credits and Burpee with speed	"	.248
Honor Credits and agility with speed	"	.16
Honor Credits and agility with P.P.I.	"	.13
Honor Credits and Burpee with agility	"	.304
P.P.I. and Brace with Honor Credits	"	.67
P.P.I. and Agility with speed	"	.09
Brace and balance with agility	"	.40
Brace and strength index with agility	"	.56
Brace and agility with balance	"	.54
Brace and strength index with balance	"	.54
Balance and strength index with agility	"	.27
Agility and strength ind x with balance	"	.25
Agility and speed with P.P.I.	"	.59
Agility and Burpee with speed	"	.05
Speed and Burpee with agility	"	.234

TABLE V

SECOND ORDER CORRELATIONS

Honor Credits and P.F.I. with speed and agility	constant	.38
Honor Credits and speed with P.F.I. and agility	"	-.03
Honor Credits and agility with P.F.I. and speed	"	.13
Honor Credits and speed with agility and Burpee	"	.13
Honor Credits and agility with speed and Burpee	"	.14
Honor Credits and Burpee with speed and agility	"	.28
Brace and balance with agility and strength index	"	.31
Brace and agility with balance and strength index	"	.49
Brace and strength index with balance and agility	"	.49

TABLE V

SECOND ORDER CORRELATIONS

TABLE VI

REGRESSION COEFFICIENTS

Honor Credits and P.F.I. with speed and agility	.08
Honor Credits and speed with P.F.I. and agility	-.16
Honor Credits and agility with speed and P.F.I.	.07
Honor Credits and speed with agility and Burpee	.61
Honor Credits and agility with speed and Burpee	.09
Honor Credits and Burpee with speed and agility	1.70
Honor Credits and P.F.I. with Brace	.10
Honor Credits and Brace with P.F.I.	-.077
Brace and balance with agility and strength index	.35
Brace and agility with balance and strength index	.25
Brace and strength index with balance and agility	.004

TABLE VI

REGRESSION COEFFICIENTS

TABLE VII

REGRESSION EQUATIONS AND MULTIPLE CORRELATIONS

NO.	SCORE FORM EQUATION	MULTIPLE CORRELATION
I	H.C. = .10 P.F.I. -.077 Brace + 10.44	.50
II	H.C. = .61 speed + .09 agility + 1.7 Burpee - 11	.50
III	H.C. = .08 P.F.I. -.16 speed + .07 agility + 9.35	.56
IV	Brace = .37 balance + .23 agility + .004 strength-19.6	.76

TABLE VIII

APPLICATION OF EQUATIONS TO RANDOM SELECTION OF CASES *

Equations are numbered in the order presented in this thesis . The figures in columns I,II,III are derived from the equations by substitution of actual test scores and represent the ranges between which the actual number of Honor Credits will fall in fifty out of one hundred cases.

CASE NO	I (agility speed Burpee) R = .50	II (P.F.I. Brace) R = .50	III (speed agility P.F.I.) R = .56	ACTUAL NUMBER HONOR CREDITS
20	✓19.3 ± 2.54	✓20.8 ± 2.51	21.3 ± 2.43	18
40	✓18.8 ± 2.54	✓21.1 ± 2.51	✓20.3 ± 2.43	19
50	✓16.9 ± 2.54	21.1 ± 2.51	19.5 ± 2.43	16
70	✓19.3 ± 2.54	✓16.7 ± 2.51	✓16.4 ± 2.43	18
80	✓19.4 ± 2.54	✓21.4 ± 2.51	✓20.5 ± 2.43	22
90	✓19.2 ± 2.54	✓20.9 ± 2.51	✓19.9 ± 2.43	17
100	✓21.4 ± 2.54	✓21.6 ± 2.51	19.0 ± 2.43	23
120	✓18.2 ± 2.54	✓18.4 ± 2.51	✓18.9 ± 2.43	19
130	17.3 ± 2.54	✓16.7 ± 2.51	✓15.7 ± 2.43	13
140	✓18.2 ± 2.54	✓17.9 ± 2.51	✓17.9 ± 2.43	20
150	18.3 ± 2.54	19.7 ± 2.51	18.5 ± 2.43	23
160	19.1 ± 2.54	19.8 ± 2.51	19.5 ± 2.43	26

* Every tenth case has been included except where scores are incomplete. See complete score table.

✓ Instances in which the actual number of Honor Credits received falls within the limits predicted by the equation.

TABLE VIII

APPLICATION OF EQUATIONS TO RANDOM SELECTION OF CASES *

Equations are numbered in the order presented in this thesis. The figures in columns I, II, III are derived from the equations by substitution of actual test scores and represent the ranges between which the actual number of Honor Credits will fall in fifty out of one hundred cases.

CASE NO	I (agility speed Burpee) R .50	II (P.F.I. Brace) R .50	III (speed agility P.F.I.) R .56	ACTUAL NUMBER HONOR CREDITS
20	√19.3 ± 2.54	√20.8 ± 2.51	21.3 ± 2.43	18
40	√18.8 ± 2.54	√21.1 ± 2.51	√20.3 ± 2.43	19
50	√16.9 ± 2.54	21.1 ± 2.51	19.5 ± 2.43	16
70	√19.3 ± 2.54	√16.7 ± 2.51	√16.4 ± 2.43	18
80	√19.4 ± 2.54	√21.4 ± 2.51	√20.5 ± 2.43	22
90	√19.2 ± 2.54	√20.9 ± 2.51	√19.9 ± 2.43	17
100	√21.4 ± 2.54	√21.6 ± 2.51	19.0 ± 2.43	23
120	√18.2 ± 2.54	√18.4 ± 2.51	√18.9 ± 2.43	19
130	17.3 ± 2.54	√16.7 ± 2.51	15.7 ± 2.43	13
140	√18.2 ± 2.54	√17.9 ± 2.51	√17.9 ± 2.43	20
150	18.3 ± 2.54	19.7 ± 2.51	18.5 ± 2.43	23
160	19.1 ± 2.54	19.8 ± 2.51	19.5 ± 2.43	26

* Every tenth case has been included except where scores are incomplete. See complete score table.

√ Instances in which the actual number of Honor Credits received falls within the limits predicted by the equation.

STATISTICAL RESEARCH

CORRELATION SCATTERGRAMS, ZERO ORDER

CORRELATION OF AGILITY WITH BALANCE: .32

	BALANCE															
AGILITY	6	7	8	9	10	11	12	13	14	15	16	F	d	Fd	Fd^2	$\Sigma X'Y'$
60-62.9					1	3			2			6	-6	-36	216	78
63-65.9					1	1		1	1			4	-5	-20	100	40
66-68.9						2	1		1	2		6	-4	-24	96	24
69-71.9							3	4	1			8	13	424	72	30
72-74.9					2	3	1	1	2	1	1	11	-2	-22	44	30
75-77.9				2	2	1	1	3	2	5	2	19	-1	-19	19	16
78-80.9					1	2	2	2	3	2		12	0			
81-83.9			1			1	3	3	4	3	3	18	1	18	18	-9
84-86.9					1	1	3	3	3	3	3	17	2	34	68	-14
87-89.9							1	2	3	2	1	9	3	27	81	00
90-92.9							1	1		1	1	4	4	16	64	00
93-95.9						1		1	3	1	1	7	5	35	175	-5
96-98.9										1	2	3	6	18	108	30
99-101.9								1	1			2	7	98		-7
F			1	2	8	15	16	22	26	22	14	126		17	1159	213
d			-6	-5	-4	-3	-2	-1	0	1	2					
Fd			-6	-10	-32	-45	-36	-22		22	28	-101				
Fd^2			36	50	128	135	72	22		22	56	521				

$$r = \frac{\frac{213}{126} - \left(\frac{17}{126} \cdot \frac{-101}{126}\right)}{\sqrt{\frac{1159}{126} - .135^2}\sqrt{\frac{521}{126} - .8}^2} = .32$$

CORRELATION OF AGILITY AND HONOR CREDITS .38

Honor Credits

Agility	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	27-28	29-30	F	d	Fd	Fd^2	$\Sigma x'y'$
56-58	1											1	-8	-8	64	40
59-61			1		1	2						4	-7	-28	196	28
62-64			3	1								4	-6	-24	144	66
65-67			1		2				1			4	-5	-20	100	10
68-70			2		2	4	2	1				11	-4	-44	176	16
71-73	1	1	2	1	2	1		2	1			11	-3	-33	99	36
74-76		1	2	1	4	4	3	4				19	-2	-38	76	10
77-79	1		2			5	3	4	2			17	-1	-17	17	-6
80-82			3	1	1	5	3	6	5			24	0			
83-85				3	1	7	3	2	2	1	1	20	1	20	20	15
86-88			1			3	3	3	2			12	2	24	48	24
89-91			1	1		1	1	2		1		7	3	21	63	12
92-94			1		1	1	1	1		1		6	4	24	96	12
95-97						1	1	1		1		4	5	20	100	35
98-100																
101-103						2		1				3	7	21	147	14
F	3	2	19	8	14	36	20	27	13	4	1	147		-82	1445	318
d	-5	-4	-3	-2	-1	0	1	2	3	4	5					
Fd	-15	-8	-57	-16	-14		20	54	39	16	5	74				
Fd^2	75	32	171	32	14		20	108	117	64	25	658				

$$r = \frac{\frac{312}{147} - \left(\frac{-82}{147} \cdot \frac{74}{147}\right)}{\sqrt{\frac{1445}{147} - .56^2}\sqrt{\frac{658}{147} - .5^2}} = .38$$

CORRELATION OF AGILITY WITH STRENGTH INDEX : 31

INDEX	57-599	60-639	63-659	66-689	69-719	72-749	75-779	78-809	81-839	84-869	87-899	90-929	93-959	96-989	99-1019	F	d	Fd	Fd²
900-999		1	1													2	-5	-10	50
1000-1099	1				1		1			1						4	-4	-16	64
1100-1199			2	1	1	1	4		1		1		1			12	-3	-36	108
1200-1299		1		1	5	4	3	1	2	1						18	-2	-36	72
1300-1399				1	1	2	1	3	2	3	2	1	2			18	-1	-18	18
1400-1499		1			1	4	5	4	2	3			1		1	22	0		
1500-1599						1	3	1	2	1	1	2				11	1	11	11
1600-1699							1	1	1	4	1		1			9	2	18	36
1700-1799						1	1	3	3	2			1		1	12	3	36	108
1800-1899								1	1	1		1	1	1		6	4	24	96
1900-1999									1		1					2	5	10	50
2000-2099											1	1		1		3	6	18	108
2100-2199										1						1	7	7	49
2200-2299																			
2300-2399																			
2400-2499													1			1	10	10	100
F	1	3	3	3	9	13	19	14	15	17	7	5	8	2	2	121		18	870
d	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8				
Fd	-6	-15	-12	-9	-18	-13		14	30	51	28	25	48	14	16	153			
Fd²	36	75	48	27	36	13		14	60	153	112	125	288	98	128	1213			
$\Sigma X'Y'$	24	35	44	18	36	9		11	24	51	36	55	84	70	24	521			

AGILITY

$$r = \frac{\frac{521}{121} - \left(\frac{18}{121} \cdot \frac{153}{121}\right)}{\sqrt{\frac{870}{121} - .149^2}\ \sqrt{\frac{1213}{121} - 1.26^2}} = .31$$

CORRELATION OF BALANCE AND STRENGTH INDEX .34

	Balance															
Strength index	6	7	8	9	10	11	12	13	14	15	16	F	d	Fd	Fd^2	$\Sigma x'y'$
900 - 999								1	1			2	-5	-10	50	-5
1000-1099				1			1		1			3	-4	-12	48	16
1100-1199		1	1		2	1	2	2	2	1	1	13	-3	-39	117	42
1200-1299						4	3	1	4		1	13	-2	-26	52	8
1300-1399					1	2	2	2	4	2	1	14	-1	-14	14	-2
1400-1499				1	3	1	2	4	2	3	2	18	0			
1500-1599					1		2	3	1	2	1	10	1	10	10	1
1600-1699							3	1	3			7	2	14	28	
1700-1799						1	1	4		3	1	10	3	30	90	18
1800-1899									1	2	1	4	4	16	64	32
1900-1999								1			1	2	5	10	50	15
2000-2099									1	1		2	6	12	72	18
2100-2199										1	1	2	7	14	98	35
2200-2299																
2300-2399																
2400-2499									1			1	10	10	100	10
F		1	1	2	7	9	16	19	21	15	10	101		15	793	188
d		-6	-5	-4	-3	-2	-1	0	1	2	3					
Fd		-6	-5	-8	-21	-18	-16		21	30	30	7				
Fd^2		36	25	32	63	36	16		21	60	90	379				

$$r = \frac{\frac{188}{101} - \left(\frac{15}{101} \cdot \frac{7}{101}\right)}{\sqrt{\frac{793}{101} - .149^2}\sqrt{\frac{379}{101} - .069^2}} = .34$$

CORRELATION OF BRACE WITH AGILITY : .60

BRACE	AGILITY 60 thro 62	63 65	66 68	69 71	72 74	75 77	78 80	81 83	84 86	87 89	90 92	93 95	96 98	99 101	102 104	F	d	Fd	Fd²
20													1			1	9	9	81
19																			
18												1	1			2	7	14	98
17									1	1		1				3	6	18	108
16								2		1	1					4	5	20	100
15					1			1	1	1	2					6	4	24	96
14						2		2	5				1			10	3	30	90
13						1	2	3	1	1	1	1		1		11	2	22	44
12					1	4	2	1	3			1				12	1	12	12
11				2	3	3	6	4	2	2	1	1		1		25	0		
10	1	1	1	4	2	5	4	2	2	2		1				26	-1	-26	26
9	2		1	2	4	2	2	2	1							16	-2	-32	64
8	2	1	2	2	3	1	2	1	1							15	-3	-45	135
7		3		1	1	3			1							8	-4	-32	128
6																			
5			1					1								2	-6	-12	76
4																			
3	1															1	-8	-8	64
F	6	5	5	11	15	21	18	19	17	8	5	7	3	2		142		-6	700
d	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7					
Fd	-36	-25	-20	-33	-30	-21		19	34	24	20	35	18	14		-1			
Fd²	216	125	80	99	60	21		19	68	72	175	108	98			1221			
X'Y'	114	80	60	54	36	12		12	38	45	60	70	114	14		709			

$$r = \frac{\frac{709}{142} - \left(\frac{-6}{142} \cdot \frac{-1}{142}\right)}{\sqrt{\frac{1122}{142} - .042^2}\sqrt{\frac{1221}{142} - .007^2}} = .60$$

CORRELATION OF BRACE WITH BALANCE : .49

BRACE \ BALANCE	6	7	8	9	10	11	12	13	14	15	16	F	d	Fd	Fd^2	$\Sigma X'Y'$
3									1			1	-8	-8	64	-8
4																
5			1			1						2	-6	-12	72	42
6							1					1	-5	-5	25	5
7		1		1	1	1		1	1	2		8	-4	-32	128	40
8					2	3	4	1	2	1		13	-3	-39	107	36
9				1	1	5	2	1	1		1	12	-2	-24	48	30
10					1	3	3	6	7	1	2	23	-1	-23	23	+3
11					2	2	2	4	2	2	4	18	0			
12							1	4	3	3	1	12	1	12	12	11
13					1		3	1	4	3		12	2	24	48	8
14							1	2	1	4	2	10	3	30	90	42
15								3	1	1	1	6	4	24	96	24
16									1	3		4	5	20	100	35
17									2	2	1	3	6	18	108	42
18									1		1	2	7	14	98	28
19																
20											1	1	9	9	81	27
F	1	1	2	8	15	17	23	25	22	14	128			8	1100	359
d	-6	-5	-4	-3	-2	-1	0	1	2	3						
Fd	-6	-5	-8	-24	-30	-17		25	44	42	21					
Fd^2	36	25	32	72	60	17		25	88	126	481					

$$r = \frac{\frac{359}{128} - \left(\frac{21}{128} \cdot \frac{8}{128}\right)}{\sqrt{\frac{481}{128} - .164^2}\ \sqrt{\frac{1100}{128} - .063^2}} = .49$$

CORRELATION OF BRACE WITH HONOR CREDITS : .35

BRACE	HONOR CREDITS 9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	27-28	29-30	F	d	Fd	Fd^2	$\Sigma X'Y'$
20								1				1	9	9	81	18
19																
18								1		1		2	7	14	98	42
17										2		2	6	12	72	48
16						2	1		1			4	5	20	100	20
15			1			2		2	1			6	4	24	96	16
14				1	1	2	1	1	2		1	9	3	27	81	33
13	1		1	1			3	3	1			10	2	20	40	4
12		1		1		2	1	4	3			12	1	12	12	12
11	1		4	2	4	5	4	4	3			27	0			
10			3		3	8	4	3	1			22	-1	-22	22	-1
9		1		2	1	5	2	3	1			15	-2	-30	60	-4
8		1	2		2	6	2	2	1			16	-3	-48	144	9
7	1		3	1	4	1		2				12	-4	-48	192	64
6						1						1	-5	-5	25	
5						1						1	-6	-6	36	
4																
3			1									1	-8	-8	64	24
F	3	3	15	8	15	35	18	26	14	3	1	141		-29	1123	290
d	-5	-4	-3	-2	-1	0	1	2	3	4	5					
Fd	-15	-12	-45	-16	-15		18	52	42	12	5	26				
Fd^2	75	48	135	32	15		18	104	126	48	25	626				

$$r = \frac{\frac{285}{141} - \left(\frac{-29}{141} \cdot \frac{26}{141}\right)}{\sqrt{\frac{1123}{141} - .206^2}\ \sqrt{\frac{626}{141} - .184^2}} = .35$$

CORRELATION OF BRACE WITH PHYSICAL FITNESS INDEX : .72

BRACE	50-59	60-69	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140-149	150-159	160-169	170-179	180-189	F	d	Fd	Fd^2
20												1			1	9	9	81
19																		
18										1		1			2	7	14	98
17												1			1	6	6	36
16.								1			2			1	4	5	20	100
15					2	1		1		1		1			6	4	24	96
14						3	1	1	1		1				7	3	21	63
13					2	2	2	2							8	2	16	32
12						3	3	1	3						10	1	10	10
11			1	1	3	5	9	3	1	1					24	0		
10		1	3	2	2	6	2	1							17	-1	-17	17
9			1	2	4	3	1		1						12	-2	-24	48
8		1	1	3	2	3	1								11	-3	-33	99
7	3	2	1	3	1			1							11	-4	-44	176
6					1										1	-5	-5	25
5			1												1	-6	-6	36
4																		
3			1												1	-8	-8	64
F	3	4	9	11	17	26	19	11	6	3	3	4		1	117		-17	981
d	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8				
Fd	-15	-16	-27	-22	-17		19	22	18	12	15	24		8	21			
Fd^2	75	64	81	44	17		19	44	54	48	75	144		64	729			
$\Sigma X'Y'$	60	48	78	54	13		3	24	12	44	65	156		40	597			

$$r = \frac{\frac{597}{117} - \left(\frac{-17}{117} \cdot \frac{21}{117}\right)}{\sqrt{\frac{981}{117} - .145^2}\sqrt{\frac{729}{117} - .18^2}} = .72$$

CORRELATION OF BRACE WITH STRENGTH INDEX : .57

BRACE	STRENGTH INDEX (in 100 lbs.) 9-99	10-109	11-119	12-129	13-139	14-149	15-159	16-169	17-179	18-189	19-199	20-209	21-219	22-229	23-239	24-249	F	d	Fd	Fd²
3				1													1	-8	-8	64
4																				
5			1														1	-6	-6	36
6			1														1	-5	-5	25
7		1	5	1	1	2			1								11	-4	-44	176
8	1		1	3	2	2	1	1									11	-3	-33	99
9		1	1	4	2	4											12	-2	-24	48
10	1	1	4	3	1	1	2	2	2								17	-1	-17	17
11			1	2	3	5	3		6	3	1						24	0		
12					3	3	1	2		1							10	1	10	10
13					2	3		3									8	2	16	32
14				1	2	3							1				7	3	21	63
15						1	3		1		1						6	4	24	96
16				1					1			2					4	5	20	100
17										1							1	6	6	36
18													1			1	2	7	14	198
19																				
20										1							1	9	9	81
F	2	3	14	16	16	24	10	8	11	6	2	2	2			1	117			
d	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10				
Fd	-10	-12	-42	-32	-16		10	16	33	24	10	12	14			10	17			
Fd²	50	48	126	64	16		10	32	99	96	50	72	98			100	861			
Σx'y'	20	28	120	50	2		8	6	10	64	12	60	70			70	520			

$$r = \frac{\frac{520}{117} - \left(\frac{-17}{117} \cdot \frac{17}{117}\right)}{\sqrt{\frac{981}{117} - .15^2}\sqrt{\frac{861}{117} - .15^2}} = .57$$

CORRELATION OF BURPEE AND AGILITY .26

Burpee

Agility	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	F	d	Fd	Fd²
56-58				1									1	-8	-8	64
59-61	1			1	2								4	-7	-28	196
62-64		1		2									3	-6	-18	108
65-67			2		2		1						5	-5	-25	125
68-70				6	3	1							10	-4	-40	160
71-73			1	1	5	1	2						10	-3	-30	90
74-76		1	5	3	6	4							19	-2	-38	76
77-79			1	3	6	1	2						13	-1	-13	13
80-82			1	4	9	6							20	0		
83-85			2	7	7	2							18	1	18	18
86-88			1	1	4	5		1					12	2	24	48
89-91				1	2	3							6	3	18	54
92-94		1		3		1							5	4	20	80
95-97								1				1	2	5	10	100
98-100																
101-103				1	1	1							3	7	21	147
F	1	3	13	34	47	25	5	2				1	131		-89	1279
d	-4	-3	-2	-1	0	1	2	3				7				
Fd	-4	-9	-26	-34		25	10	6				7	-25			
Fd	16	27	52	34		25	20	18				49	241			
$\Sigma x'y'$	28	12	40	32		9	-26	21				49	151			

$$r = \frac{\frac{151}{131} - \left(\frac{-89}{131} \cdot \frac{-25}{131}\right)}{\sqrt{\frac{1279}{131} - .68^2}\sqrt{\frac{241}{131} - .191^2}} = .26$$

Burpee

Agility	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	F	d	Fd	Fd²
56-58				1									1	-8	-8	64
59-61		1		1	2								4	-7	-28	196
62-64			1	2									3	-6	-18	108
65-67			2	2	1								5	-5	-25	125
68-70				6	3	1							10	-4	-40	160
71-73			1	1	5	1	2						10	-3	-30	90
74-76		1	5	3	6	4							19	-2	-38	76
77-79			1	3	6	1	2						13	-1	-13	13
80-82			1	4	9	6							20	0		
83-85			2	7	7	2							18	1	18	18
86-88			1	1	4	5		1					12	2	24	48
89-91				1	2	3							6	3	18	54
92-94		1		3	1								5	4	20	80
95-97								1				1	2	5	10	100
98-100																
101-103				1	1	1							3	7	21	147
F	1	3	13	34	47	25	5	2				1	131		-89	1279
d	-4	-3	-2	-1	0	1	2	3				7				
Fd	-4	-9	-26	-34		25	10	6				7	-25			
Fd	16	27	52	34		25	20	18				49	241			
x'y'	28	12	40	32		9	-26	21				49	151			

$$r = \frac{\frac{151}{131} - \left(\frac{-89}{131} \cdot \frac{-25}{131}\right)}{\sqrt{\frac{1279}{131} - .68}\ \sqrt{\frac{241}{131} - .191}} = .26$$

CORRELATION OF BURPEE AND HONOR CREDITS .37

Honor Credits	Burpee 4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9.5	F	d	Fd	Fd^2	$\Sigma x'y'$	
9 - 10			1	1								2	-5	-10	50	15	
11 - 12																	
13 - 14	2	1	1	5	4							13	-3	-39	117	54	
15 - 16		1	2	1	3	2						9	-2	-18	36	12	
17 - 18		1	3	3	6	2	1					16	-1	-16	16	8	
19 - 20			6	11	7	9						33	0				
21 - 22			1	2	8	5	2	1				19	1	19	19	8	
23 - 24				5	9	6	1	1				23	2	46	96	10	
25 - 26			1	1	9	2						13	3	39	117		-3
27 - 28				1							1	2	4	8	32	24	
29 - 30				1								1	5	5	25		-5
F	2	3	15	32	46	26	4	2			1	131		34	508	123	
d	-4	-3	-2	-1	0	1	2	3			7						
Fd	-8	-9	-30	-32		26	8	6			7	-32					
Fd^2	32	27	60	32		26	16	18			49	260					

$$r = \frac{\frac{123}{131} - \left(\frac{34}{131} \cdot \frac{-32}{131}\right)}{\sqrt{\frac{508}{131} - .26^2}\sqrt{\frac{260}{131} - .244^2}} = .37$$

CORRELATION OF BURPEE AND RANKING .32

	Ranking													
Burpee	2	3	4	5	6	7	8	9	10	F	d	Fd	Fd^2	$\Sigma x'y'$
4								2		2	-4	-8	32	24
4.5							1	1	1	3	-3	-9	27	27
5	1				8	1	4		1	15	-2	-30	60	18
5.5	2		4	5	11	8	4	2	1	37	-1	-37	37	-3
6	2	2	7	7	14	9	7	2	1	51	0			
6.5		1	5	7	10	2	3			28	1	28	28	12
7				1	2	2				5	2	10	20	-2
7.5			1		1					2	3	6	18	6
8														
8.5														
9														
9.5	1									1	7	7	49	28
F	6	3	17	20	46	22	19	7	4	144		-33	271	110
d	4	3	2	1	0	-1	-2	-3	-4					
Fd	24	9	34	20		-22	-38	-21	-16	-10				
Fd^2	96	27	68	20		22	76	63	64	436				

$$r = \frac{\frac{110}{144} - \left(\frac{-10}{144} \cdot \frac{-33}{144}\right)}{\sqrt{\frac{436}{144} - .0695^2}\sqrt{\frac{271}{144} - .23^2}} = .32$$

Ranking

Borders	2	3	4	5	6	7	8	9	10	$\bar{P}$	d	$\bar{P}d$	$\bar{P}d^2$	$\bar{x}'\bar{y}'$
4								2		2	-4	-8	32	24
4.5								1	1	1	3	-3	9	27
5	1				8	1	4		1	15	-2	-30	60	18
5.5	2		4	5	11	8	4	2	1	37	-1	-37	37	-3
6	2	2	7	7	14	9	7	2	1	51	0			
6.5		1	5	7	10	2	3			28	1	28	28	12
7				1	2	2				5	2	10	20	-2
7.5			1		1					2	3	6	18	6
8														
8.5														
9														
9.5	1									1	7	7	49	28
$\bar{P}$	6	3	17	20	46	22	19	7	4	144		-33	271	110
d	4	3	2	1	0	-1	-2	-3	-4					
$\bar{P}d$	24	9	34	20		-22	-38	-21	-16	-10				
$\bar{P}d^2$	96	27	68	20		22	76	63	64	436				

$$r = \frac{\frac{110}{144} - \left(\frac{-10}{144} \cdot \frac{-33}{144}\right)}{\sqrt{\left(\frac{436}{144} - .0695\right)\left(\frac{271}{144} - .23\right)}} = .32$$

CORRELATION OF HONOR CREDITS AND BALANCE .23

Honor Credits

Balance	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	27-28	29-30	F	d	Fd	Fd^2	$\Sigma x'y'$
7				1								1	-7	-7	49	14
8						1						1	-6	-6	36	
9			1			1						2	-5	-10	50	15
10			2	1	2	1		1				7	-4	-28	112	32
11			1	1	3	2	2	4	1			14	-3	-42	126	-15
12	1		1	1	1	5	3	1	2			15	-2	-30	60	
13			1		1	5	3	5	2		1	21	-1	-21	21	-26
14			6	1	4	5	3	5	1			25	0			
15			1	2	1	6	3	4	3	2		22	1	22	22	20
16		1	1			2	1	3	3	2		13	2	26	52	34
F	1	1	14	7	12	28	15	26	12	4	1	121		-96	528	74
d	-5	-4	-3	-2	-1	0	1	2	3	4	5					
Fd	-5	-4	-42	-14	-12		15	52	36	16	5	47				
Fd	25	16	126	28	12		15	104	108	64	25	523				

$$r = \frac{\frac{74}{121} - \left(\frac{-96}{121} \cdot \frac{47}{121}\right)}{\sqrt{\frac{528}{121} - .79^2}\sqrt{\frac{523}{121} - .39^2}} = .233$$

CORRELATION OF HONOR CREDITS WITH PHYSICAL FITNESS INDEX : .53

P.F.I.	Honor Credits 9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	27-28	29-30	F	d	Fd	Fd^2	$\Sigma X'Y'$
50-59			2		1							3	-5	-15	75	35
60-59	1		1		1	1						4	-4	-16	64	36
70-79	1		4	1	1	3						10	-3	-30	90	60
80-89			3	2	3	3	2	1				14	-2	-28	56	26
90-99			1	1	3	5		4	2			16	-1	-16	16	-6
100-109		1	4	1	1	9	6	3	1			26	0			
110-119			2	2	2	4	4	5	2			21	1	21	21	8
120-129			1			4	3	4	2		1	15	2	30	60	38
130-139					1	1		2	2			6	3	18	54	27
140-149								1	1	1		3	4	12	48	36
150-159						1	1	1	1			4	5	20	100	30
160-169						1		2		1		4	6	24	144	48
170-179																
180-189							1					1	8	8	64	8
F	2	1	18	7	13	32	17	23	11	2	1	127		28	792	352
d	-5	-4	-3	-2	-1	0	1	2	3	4	5					
Fd	-10	-4	-54	-14	-13		17	46	33	8	5	14				
Fd^2	50	16	162	28	13		17	92	99	32	25	534				

$$r = \frac{\frac{346}{127} - \left(\frac{28}{127} \cdot \frac{14}{127}\right)}{\sqrt{\frac{792}{127} - .22^2}\sqrt{\frac{534}{127} - .11^2}} = .53$$

CORRELATION OF HONOR CREDITS WITH TEACHER RANKING .71

Honor Credits	Teacher Ranking 2	3	4	5	6	7	8	9	10	F	d	Fd	Fd^2
9 - 10				1		1		1	2	5	-5	-25	125
11-- 12			1					2		3	-4	-12	48
13 - 14					1	6	2	11		20	-3	-60	180
15 - 16				1	3		7			11	-2	-22	44
17 - 18			1		4	7	5			17	-1	-17	17
19 - 20	1		4	3	17	9	4		1	39	0		
21 - 22	1	1	2	4	12	1				21	1	21	21
23 - 24	1	3	5	6	9	3				27	2	54	108
25 - 26	2	1	5	4	1					13	3	39	117
27 - 28	3		1							4	4	16	64
29 - 30	1									1	5	5	25
F	9	5	19	19	47	27	18	14	3	161		-1	749
d	4	3	2	1	0	-1	-2	-3	-4				
Fd	36	15	38	19		-27	-36	-42	-12	-9			
Fd^2	144	45	76	19		27	72	126	48	557			
$\Sigma x'y'$	104	30	52	21		23	50	138	40	458			

$$r = \frac{\frac{458}{161} - \left(\frac{1.0}{161} \cdot \frac{-9}{161}\right)}{\sqrt{\frac{749}{161} - .006^2}\sqrt{\frac{557}{161} - .056^2}} = .71$$

CORRELATION OF HONOR CREDITS WITH TEACHERS RANKING .71

Teacher Ranking

Honor Credits	2	3	4	5	6	7	8	9	10	Σ	d	Σd	Σd^2
9 - 10				1		1		1	2	5	-5	-25	125
11-- 12			1					2		3	-4	-12	48
13 - 14					1	6	2	11		20	-3	-60	180
15 - 16				1	5		7			11	-2	-22	44
17 - 18			1		4	7	5			17	-1	-17	17
19 - 20	1		4	3	17	9	4		1	39	0		
21 - 22	1	1	2	4	12	1				21	1	21	21
23 - 24	1	3	5	6	9	3				27	2	54	108
25 - 26	2	1	5	4	1					13	3	39	117
27 - 28	3		1							4	4	16	64
29 - 30	1									1	5	5	25
F	9	5	19	19	47	27	18	14	3	161		-1	749
d	4	3	2	1	0	-1	-2	-3	-4				
Fd	36	15	38	19		-27	-36	-42	-12	-9			
Fd^2	144	45	76	19		27	72	126	48	557			
Σx'y'	104	30	32	21		23	50	126	40	456			

$$r = \frac{\frac{456}{161} - \frac{(3.0 \cdot -9.)}{161}}{\sqrt{\frac{749}{161} - .056^2}\sqrt{\frac{557}{161} - .056^2}} = .71$$

CORRELATION OF P.F.I. AND AGILITY .54

Agility	P.F.I. 50 59	60 69	70 79	80 89	90 99	100 109	110 119	120 129	130 139	140 149	150 159	160 169	170 179	180 189	F	d	Fd	Fd²
59-61			2		1	1									4	-5	-20	100
62-64	1	1	1												3	-4	-12	48
65-67	1				1										2	-3	-6	18
68-70		2	1	1	2	2									8	-2	-16	32
71-73		1	2	2		3			1						9	-1	-9	9
74-76	1		2	3	3	5	3		1						18	0		
77-79				2	2	4	5	1	1	1					16	1	16	16
80-82			1	2	1	3	4	3			2				16	2	32	64
83-85				1	1	5	3	6							16	3	48	144
86-88					1	1	1	3	2		1	1		1	11	4	44	176
98-91					2		2			1	1				6	5	30	150
92-94					1	2	1					2			6	6	36	216
95-97				1						1		1			4	7	28	196
98-100																		
101-103							2								2	9	18	162
F	3	4	9	12	15	27	21	13	5	3	4	4		1	121		189	1331
d	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8				
Fd	-15	-16	-27	-24	-15		21	26	15	12	20	24		8	29			
Fd²	75	64	81	48	15		21	51	45	48	100	144		64	757			
Σx'y'	36	36	48	-28	-15		60	74	24	52	65	138		32	522			

$$r = \frac{\frac{522}{121} - \left(\frac{189}{121} \cdot \frac{29}{121}\right)}{\sqrt{\frac{1331}{121} - 1.56^2}\sqrt{\frac{757}{121} - .24^2}} = .54$$

P.F.I.

Ability	50	60	70	80	90	100	110	120	130	140	150	160	170	180	P	d	Pd	Pd²
	59	59	79	89	99	109	119	129	139	149	159	169	179	189				
50-61					2		1	1							4	-5	-20	100
62-64	1	1	1												3	-4	-12	48
65-67	1					1									2	-3	-6	18
68-70		2	1	1	2	2									8	-2	-16	32
71-73		1	2	2		2			1						9	-1	-9	9
74-76	1		2	3	3	5	3		1						18	0		
77-79				2	2	4	5	1	1	1					16	1	16	16
80-82			1	2	1	3	4	3			2				16	2	32	64
83-85				1	1	5	3	6							16	3	48	144
86-88					1	1	3	2		1	1		1	11	4	44	176
89-91					2		2		1	1					6	5	30	150
92-94					1	2	1				2				6	6	36	216
95-97				1					1		1				4	7	28	196
98-100																		
101-103								2							2	9	18	162
P	3	4	9	12	15	27	21	13	5	3	4	4		1	121		189	1331
d	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8				
Pd	-15	-16	-27	-24	-15		21	26	15	12	20	24		8	29			
Pd²	75	64	81	48	15		21	52	45	48	100	144		64	757			
(x'y'	36	36	48	28	-15		60	74	24	32	65	138		32	522			

$$r = \frac{\frac{522}{121} - \left(\frac{189}{121} \cdot \frac{29}{121}\right)}{\sqrt{\left(\frac{1331}{121} - 1.56^2\right)\left(\frac{757}{121} - .24^2\right)}} = .54$$

CORRELATION OF SPEED AND AGILITY .73

	Speed															
	18.5	19.0	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	F	d	Fd	Fd^2
Agility	18.9	19.4	19.9	20.4	20.9	21.4	21.9	22.4	22.9	23.4	23.9	24.4				
59-61						1			1	1		1	4	-7	-28	196
62-64						1					1	2	4	-6	-24	144
65-67							2	2	1	1	2	1	9	-5	-45	225
68-70					2	3	1		3				9	-4	-36	144
71-73				1		1		6	2	1			11	-3	-33	99
74-76		1		3	2	6	2	4	2	1			21	-2	-42	84
77-79			1	6	4	4	2		1				18	-1	-18	18
80-82		3	4	3	5	5	2						22	0		
83-85	1	3	4	8	1	6							23	1	23	23
86/88	2		4	4	1	1							12	2	24	48
89-91	1		2	2	1		1						7	3	21	62
92-94		3	3	1									7	4	28	112
95-97	2				1								3	5	15	75
98-100																
101-103			1	1									2	7	14	98
F	6	10	19	29	17	28	10	12	10	4	3	4	152		-101	1329
d	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6				
Fd	30	40	57	58	17		-10	-24	-30	-16	-15	-24	83			
Fd'	150	160	171	116	17		10	48	90	64	75	144	1045			
$\Sigma x'y'$	90	52	108	32	-3		17	72	105	68	80	144	765			

$$r = \frac{\frac{765}{152} - \left(\frac{-101}{152} \cdot \frac{83}{152}\right)}{\sqrt{\frac{1329}{152} - .665} \quad \sqrt{\frac{1045}{152} - .545}} = .73$$

$$r = \frac{\frac{765}{152} - \left(\frac{-101}{152}\right)\left(\frac{83}{152}\right)}{\sqrt{\frac{1329}{152} - .665^2}\ \sqrt{\frac{1043}{152} - .545^2}} = .73$$

CORRELATION OF SPEED AND BALANCE .40

Speed	Balance 7	8	9	10	11	12	13	14	15	16	F	d	Fd	Fd^2	$\Sigma x'y'$
24.0-24.2	1			1	2			1			5	-6	-30	180	72
23.5-23.9					1	1			1		3	-5	-15	75	5
23.0-23.4				1				1	1		3	-4	-12	48	
22.5-22.9			2	1	3	1	1	1		1	10	-3	-30	90	42
22.0-22.4				1	1	3	1	4	1		11	-2	-22	44	4
21.5-21.9		1				2		3	2	2	10	-1	-10	10	-6
21.0-21.4			1	2	4	3	8	2	1	1	22	0			
20.5-20.9				3	1	2	5	1	3	1	16	1	16	16	-3
20.0-20.4						2	3	6	6	3	20	2	40	80	40
19.5-19.9					2	1	2	4	4	2	15	3	45	135	39
19.0-19.4					1	2	1	2	2	3	11	4	44	176	44
18.5- 18.9							1	1	1	2	5	5	25	125	45
F	1	1	3	9	15	17	22	26	22	15	131		51	979	282
d	-6	-5	-4	-3	-2	-1	0	1	2	3					
Fd	-6	-5	-12	-27	-30	-17		26	44	45	18				
Fd^2	36	25	48	81	60	17		26	88	135	516				

$$r = \frac{\frac{282}{131} - \left(\frac{18}{131} \cdot \frac{51}{131}\right)}{\sqrt{\frac{516}{131} - .0196}\ \sqrt{\frac{979}{131} - .1521}} = .40$$

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CORRELATION OF SPEED AND BRACE .59

	Speed															
	24.0	23.5	23.0	22.5	22.0	21.5	21.0	20.5	20.0	19.5	19.0	18.5				
Brace	24.4	23.9	23.4	22.9	22.4	21.9	21.4	20.9	20.4	19.9	19.4	18.9	F	d	Fd	Fd^2
3			1										1	-8	-8	64
4																
5	1												1	-6	-6	36
6																
7	2		1	2	1	1		1	1				9	-4	-36	144
8				2	1	3	1	1	1		1		10	-3	-30	90
9		1	1		2	2	4	1	2	1			14	-2	-28	56
10	1		1		3		5	5	1	2	1		19	-1	-19	19
11				1	1		5	3	4	6	3		23	0		
12					1	1	2	1	2		1		8	1	8	8
13							2	1	4	2			9	2	18	36
14						1	2		4	2			9	3	27	81
15				1				1	3			1	6	4	24	96
16									1		1	2	4	5	20	100
17										3			3	6	18	108
18											1	1	2	7	14	98
19																
20												1	1	9	9	81
F	4	1	4	6	9	8	21	14	23	16	8	5	119		11	1017
d	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4				
Fd	-28	-6	-10	-14	-17	-16	-21		23	32	24	20	-43			
Fd^2	196	36	100	96	81	32	21		23	64	72	80	801			
$\Sigma x'y'$	105	12	75	40	39	26	4		27	48	27	116	519			

$$r = \frac{\frac{519}{119} - \left(\frac{-43}{119} \cdot \frac{11}{119}\right)}{\sqrt{\frac{801}{119} - .1219}\sqrt{\frac{1017}{119} - .008}} = .588$$

CORRELATION OF SPEED AND BURPEE .313

	Burpee																
Speed	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	F	d	Fd	Fd^2	$\Sigma x'y'$
18.5-18.9					1	2						1	4	5	20	100	45
19.0-19.4				1	3	5							9	4	36	144	16
19.5-19.9		1		5	5	5							16	3	48	144	-9
20.0-20.4			4	9	7	5		1					26	2	52	104	-18
20.5-20.9				6	4	4	1	1					16	1	16	16	3
21.0-21.4			2	5	14	3							24	0			
21.5-21.9			1		7		2						10	-1	-10	10	-2
22.0-22.4			2	2	3	2							9	-2	-18	36	8
22.5-22.9		1		2	3	1	1						8	-3	-24	72	6
23.0-23.4	1		2		1								4	-4	-16	64	32
23.4-23.9		1	1	1									3	-5	-15	75	30
24.0-24.4			1	1	2								4	-6	-24	144	18
F	1	3	13	32	50	27	4	2				1	133		65	909	129
d	-4	-3	-2	-1	0	1	2	3				7					
Fd	-4	-9	-26	-32		27	8	6				7	-23				
Fd^2	16	27	52	32		27	16	18				49	237				

$$r = \frac{\frac{129}{133} - \left(\frac{-23}{133} \cdot \frac{65}{133}\right)}{\sqrt{\frac{237}{133} - .17}\ \sqrt{\frac{909}{133} - .49^2}} \qquad .313$$

CORRELATION OF SPEED AND BURPSE .313

Burpse

Speed	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	F	d	Fd	Fd	xy
18.5-18.9					1	2						1	4	5	20	100	45
19.0-19.4				1	3	5							9	4	36	144	16
19.5-19.9		1		5	5	5							16	3	48	144	-9
20.0-20.4			4	9	7	5		1					26	2	52	104	-18
20.5-20.9				6	4	4	1	1					16	1	16	16	3
21.0-21.4			2	5	14	3							24	0			
21.5-21.9			1		7		2						10	-1	-10	10	-2
22.0-22.4			2	2	3	2							9	-2	-18	36	8
22.5-22.9		1		2	3	1	1						8	-3	-24	72	6
23.0-23.4	1		2		1								4	-4	-16	64	32
23.4-23.9		1	1	1									3	-5	-15	75	30
24.0-24.4			1	1	2								4	-6	-24	144	18
F	1	3	13	32	50	27	4	2				1	133		65	909	129
d	-4	-3	-2	-1	0	1	2	3				7					
Fd	-4	-9	-26	-32		27	8	6				7	-23				
Fd	16	27	52	32		27	16	18				49	237				

$$r = \frac{\frac{129}{133} - \left(\frac{-23}{133} \cdot \frac{65}{133}\right)}{\sqrt{\frac{237}{133} - .17}\ \sqrt{\frac{909}{133} - .49}} \quad .313$$

CORRELATION OF SPEED AND HONOR CREDITS .39

Speed	Honor Credits 9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	27-28	29-30	F	d	Fd	Fd^2	$\Sigma x'y'$
18.5-18.9				1		2	1	1		1		6	5	30	150	25
19.0-19.4					2	5	1	1	3	1		13	4	52	208	52
19.5-19.9	1		2	1	1	5	2	4		2		18	3	54	162	12
20.0-20.4			1	2	1	10	4	4	7		1	30	2	60	120	60
20.5-20.9	1		4		1	3	4	4	1			18	1	18	18	-3
21.0-21.4	1		2	1	2	6	4	7				23	0			
21.5-21.9			1	2	1	2	4	3				13	-1	-13	13	-2
22.0-22.4			2	1	4	3						10	-2	-20	40	24
22.5-22.9		1	3		3			3				10	-3	-30	90	30
23.0-23.4	1		2									3	-4	-12	48	44
23.5-23.9				1		1						2	-5	-10	50	10
24.0-24.4			2	1								4	-6	-24	144	30
F	4	1	19	10	15	38	20	27	11	4	1	150		105	1043	280
d	-5	-4	-3	-2	-1	0	1	2	3	4	5					
Fd	-20	-4	-57	-20	-15		20	54	33	16	5	12				
Fd^2	100	16	171	40	15		20	108	99	64	25	658				

$$r = \frac{\frac{280}{150} - \left(\frac{105}{150} \cdot \frac{12}{150}\right)}{\sqrt{\frac{1043}{150} - .7^2}\sqrt{\frac{658}{150} - .08^2}} = .39$$

CORRELATION OF SPEED AND P.F.I. .68

P.F.I.	Speed 18.5 18.9	19.0 19.4	19.5 19.9	20.0 20.4	20.5 20.9	21.0 21.4	21.5 21.9	22.0 22.4	22.5 22.9	23.0 23.4	23.5 23.9	24.0 24.4	F	d	Fd	Fd^2
50-59									2			1	3	-5	-15	75
60-69									1	1	1	1	4	-4	-16	64
70-79						2	1	4		1		1	9	-3	-27	81
80-89		1		1		1	4	4					11	-2	-22	44
90-99		1	1	5	4	1		1	1		1	1	16	-1	-16	16
100-109	1	3	1	4	5	6	3	2	2				27	0		
110-119		2	5	3	3	7	1						21	1	21	21
120-129			3	7	2	1							13	2	26	52
130-139		1	1	3		1							6	3	18	54
140-149	1			2									3	4	12	48
150-159	1	1	1	1									4	5	20	100
160-169	2	1	1										4	6	24	144
170-179																
180-189	1												1	8	8	64
F	6	10	13	26	14	19	9	11	6	2	2	4	122		33	763
d	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-8				
Fd	18	20	13		-14	-38	-27	-44	-30	-12	-14	-32	-160			
Fd^2	54	40	23		14	76	81	176	150	72	98	256	1030			
$\Sigma x'y'$	87	26	24		-3	-6	30	84	75	42	35	104	498			

$$r = \frac{\frac{498}{122} - \left(\frac{33}{122} \cdot \frac{-160}{122}\right)}{\sqrt{\frac{763}{122} - .27^2}\ \sqrt{\frac{1030}{122} - 1.31^2}} = .68$$

CORRELATION OF SPEED AND P.F.I. .68

Speed

P.F.I.	18.5 18.9	19.0 19.4	19.5 19.9	20.0 20.4	20.5 20.9	21.0 21.4	21.5 21.9	22.0 22.4	22.5 22.9	23.0 23.4	23.5 23.9	24.0 24.4	F d	Fd	Fd
50-59									2			1	3-5	-15	75
60-69									1	1	1	1	4-4	-16	64
70-79						2	1	4		1		1	9-3	-27	81
80-89		1		1		1	4	4					11-2	-22	44
90-99		1	1	5	4	1		1	1		1	1	16-1	-16	16
100-109	1	3	1	4	5	6	3	2	2				27	0	
110-119		2	5	3	3	7	1						21	1	21
120-129			3	7	2	1							13	2	26
130-139		1	1	3		1							6	3	18
140-149	1			2									3	4	12
150-159	1	1	1	1									4	5	20
160-169	2	1	1										4	6	24
170-179															
180-189	1												1	8	8
F	6	10	13	26	14	19	9	11	6	2	2	4	122	33	763
d	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-8			
Fd	18	20	13		-14	-38	-27	-44	-30	-12	-14	-32	-160		
Fd'	54	40	23		14	76	81	176	150	72	98	256	1030		
x'y'	87	26	24		-3	-6	30	84	75	42	35	104	498		

$$r = \frac{\frac{498}{122} - \left(\frac{33}{122} \cdot \frac{-160}{122}\right)}{\sqrt{\frac{763}{122} - .27^2}\sqrt{\frac{1030}{122} - 1.31^2}} = .68$$

CORRELATION OF SPEED AND RANKING .59

	Ranking													
Speed	2	3	4	5	6	7	8	9	10	F	d	Fd	Fd^2	$\Sigma x'y'$
18.5-18.9	2	1	1		2					6	5	30	150	65
19.0-19.4	2	2	2	3	3	1				13	4	52	208	80
19.5-19.9	2		3	5	5	1	2	2		20	3	60	180	24
20.0-20.4	2		5	5	14	2	1			29	2	58	116	38
20.5-20.9		2	4	4	3	2	1	1	1	18	1	18	18	7
21.0-21.4			2	2	10	6	5	2		27	0			
21.5-21.9			1	1	5	4	2			13	-1	-13	13	5
22.0-22.4					1	5	4		1	11	-2	-22	44	34
22.5-22.9					2	3	1	4		10	-3	-30	90	51
23.0-23.4						2		2	1	5	-4	-20	80	48
23.5-23.9							1			1	-5	-5	25	10
24.0-24.4					1		1	2	1	5	-6	-30	180	72
F	8	5	18	20	46	26	18	13	4	158		98	1104	434
d	4	3	2	1	0	-1	-2	-3	-4					
Fd	32	15	36	20		-26	-36	-39	-16	-14				
Fd^2	128	45	72	20		26	72	117	64	544				

$$r = \frac{\frac{434}{158} - \left(\frac{-140}{158} \cdot \frac{98}{158}\right)}{\sqrt{\frac{544}{158} - .085^2}\sqrt{\frac{1104}{158} - .62^2}} = .59$$

Ranking

Speed	2	3	4	5	6	7	8	9	10	Σ	d	Σd^2	$\Sigma x'y'$
18.5-18.9	2	1	1		2					6	5	30	150	65
19.0-19.4	2	2	2	3	3	1				13	4	52	208	80
19.5-19.9	2		3	5	5	1	2	2		20	3	60	180	24
20.0-20.4	2		5	5	14	2	1			29	2	58	116	36
20.5-20.9		2	4	3	2	1	1	1		18	1	18	18	7
21.0-21.4		3	2	10	6	5	2			27	0			
21.5-21.9		1	1	5	4	2				13	-1	-13	13	5
22.0-22.4				1	5	4		1		11	-2	-22	44	34
22.5-22.9				2	3	1	4			10	-3	-30	90	54
23.0-23.4					2		2	1		5	-4	-20	80	48
23.5-23.9						1				1	-5	-5	25	10
24.0-24.4				1			1	2	1	5	-6	-30	180	72
Σ	8	5	18	30	45	26	18	13	4	158		98	1104	434
d	4	3	2	1	0	-1	-2	-3	-4					
Σd	32	15	36	30		-26	-36	-39	-16	-14				
$\Sigma d'$	128	45	72	30		26	72	117	64	544				

$$r = \frac{\frac{434}{158} - \left(\frac{-140}{158} \cdot \frac{98}{158}\right)}{\sqrt{\left(\frac{544}{158} - .085\right)\left(\frac{1104}{158} - .62\right)}}$$

CORRELATION OF RANKING AND AGILITY .52

	Ranking													
Agility	2	3	4	5	6	7	8	9	10	F	d	Fd	Fd^2	$\Sigma x'y'$
56-58									1	1	-8	-8	64	32
59-61					2	1		1		4	-7	-28	196	28
62-64						1	1	2		4	-6	-24	144	54
65-67	1				1	1	1	1	1	6	-5	-30	150	30
68-70				1	1	7	2	1		12	-4	-48	192	48
71-73				1		6	2	2	1	12	-3	-36	108	57
74-76			1	2	7	4	4	2	1	21	-2	-42	84	36
77-79			4	3	8			3		18	-1	-18	18	-2
80-82	1	2	1	4	9	3	2			23	0			
83-85	3	1	1	5	8	1	1	1		21	1	21	21	16
86-88	1		5	3	3			1		13	2	26	51	28
89-91	1		1		4		1			7	3	21	63	12
92-94		1	1	1	2	1	1			7	4	28	112	12
95-97	2	1	1							4	5	20	100	65
98-100														
101-103			1		1		1			3	7	21	147	
F	9	5	17	20	46	25	16	14	4	156		-103	1451	416
d	4	3	2	1	0	-1	-2	-3	-4					
Fd	36	15	34	20		-25	-32	-42	-16	50				
Fd^2	144	45	68	20		25	64	126	64	556				

$$r = \frac{\frac{416}{156} - \left(\frac{-103}{156} - \frac{50}{156}\right)}{\sqrt{\frac{1451}{156} - .66^2}\ \sqrt{\frac{556}{156} - .32^2}} = .52$$

Rankings

Ability	2	3	4	5	6	7	8	9	10	Σ	d	Σd^2	$\Sigma d'^2$	$x'y'$
56-58									1	1	-8	64		32
59-61					2	1		1		4	-7	196		28
62-64						1	1	2		4	-6	144		54
65-67	1				1	1	1	1	1	6	-5	150		30
68-70				1	1	7	2	1		12	-4	192		48
71-73				1		6	2	2	1	12	-3	108		37
74-76			1	2	7	4	4	2	1	21	-2	84		36
77-79			4	3	8			3		18	-1	18		-2
80-82	1	2	1	4	9	3	2			23	0			
83-85	3	1	1	5	8	1	1	1		21	1	21		16
86-88	1		5	3	3			1		13	2	26		28
89-91	1		1		4		1			7	3	21		12
92-94		1	1	1	2	1	1			7	4	28		12
95-97	2	1	1							4	5	20		65
98-100														
101-103			1		1		1			3	7	21		147
Σ	9	5	17	20	46	25	16	14	4	156		-103	1451	416
d	4	3	2	1	0	-1	-2	-3	-4					
Σd	36	15	34	20		-25	-32	-42	-16	50				
Σd^2	144	45	68	20		25	64	126	64	556				

$$r = \frac{\frac{416}{156} - \left(\frac{-103}{156} - \frac{50}{156}\right)}{\sqrt{\left(\frac{1451}{156} - .65^2\right)\left(\frac{556}{156} - .32^2\right)}}$$

CORRELATION OF RANKING AND BALANCE

Ranking

Balance	2	3	4	5	6	7	8	9	10	F	d	Fd	Fd^2	$\Sigma x'y'$
16	2	1	3	3	4			1		14	2	28	56	34
15	3	1	5	4	6	2		1		22	1	22	22	24
14	2	2	5	2	6	5	2	3		27	0			
13	1	1	3	3	6	7	1			22	-1	-22	22	-7
12			1	3	6	3	4			17	-2	-34	68	8
11	1			2	4	2	3	1	2	15	-3	-45	135	39
10			1	1	1	1	1	2	1	8	-4	-32	128	40
9							1	1		2	-5	-10	50	25
8					1					1	-6	-6	36	
7							1			1	-7	-7	49	14
F	9	5	18	18	34	20	13	9	3	129		-106	566	177
d	4	3	2	1	0	-1	-2	-3	-4					
Fd	36	15	36	18		-20	-26	-27	-12	20				
Fd^2	144	45	72	18		20	52	81	48	480				

$$r = \frac{\frac{177}{129} - \left(\frac{-106}{129} \cdot \frac{20}{129}\right)}{\sqrt{\frac{566}{129} - .82}\sqrt{\frac{480}{129} - .155}} = .405$$

CORRELATION OF RANKING WITH BRACE .45

	Ranking													
Brace	2	3	4	5	6	7	8	9	10	F	d	Fd	Fd^2	$\Sigma x'y'$
20		1								1	9	9	81	27
19														
18	1	1								2	7	14	98	49
17	1		1	1						3	6	18	108	42
16	1	1			2					4	5	20	100	35
15	1		1	1	2	1				6	4	24	96	24
14	2		3	1	4					10	3	30	90	45
13			1	3	6	1	1			12	2	24	48	4
12			4	4	1	2		1		12	1	12	12	7
11	1		5	2	6	3	6	4		27	0			
10		1	2	3	6	7	2	3		24	-1	-24	24	10
9	1		1	1	7	2	5		1	18	-2	-36	72	18
8	1			3	4	5	1	1	1	16	-3	-48	144	21
7		1			2	4	3	2		12	-4	-48	192	52
6			1							1	-5	-5	25	-10
5					1				1	2	-6	-12	72	24
4														
3								1		1	-8	-8	64	24
F	9	5	19	19	41	25	18	12	3	151		-30	1226	372
d	4	3	2	1	0	-1	-2	-3	-4					
Fd	36	15	38	19		-25	-36	-36	-12	-1				
Fd^2	144	45	76	19		-25	72	108	48	547				

$$r = \frac{\frac{372}{151} - \left(\frac{-30}{151} \cdot \frac{-1.0}{151}\right)}{\sqrt{\frac{1226}{151} - .2^2}\ \sqrt{\frac{547}{151} - .007^2}} = .45$$

CORRELATION OF RANKING AND P.F.I.

	Ranking													
P.F.I.	2	3	4	5	6	7	8	9	10	F	d	Fd	Fd^2	$\Sigma x'y'$
50-59							1	1	1	3	-5	-15	75	45
60-69						4		1		5	-4	-20	80	28
70-79						5	2	1	1	10	-3	-30	90	48
80-89					6	3	3	1	1	14	-2	-28	56	32
90-99	1		1	1	10		3			17	-1	-17	17	-1
100-109			5	3	10	7	1	2		28	0			
110-119			4	4	7	1	3	2		21	1	21	21	-1
120-129	1			5	7			1		14	2	28	56	12
130-139			3	2		1				6	3	18	54	21
140-149	1		1		1					3	4	12	48	24
150-159		1	1		2					4	5	20	100	25
160-169		2	2							4	6	24	144	60
170-179														
180-189	1									1	8	8	64	32
F	4	3	17	15	45	21	13	9	3	130		21	805	325
d	4	3	2	1	0	-1	-2	-3	-4					
Fd	16	9	34	15		-21	-26	-27	-12	-12				
Fd^2	64	27	68	15		21	52	81	48	376				

$$r = \frac{\frac{325}{130} - \left(\frac{21}{130} \cdot \frac{-12}{130}\right)}{\sqrt{\frac{805}{130} - .16^2}\sqrt{\frac{376}{130} - .09^2}} = .60$$

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